

WIND.

The *prevailing winds* for July, 1897, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table VIII. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

Maximum wind velocities are given in Table I, which also gives the altitudes of the Weather Bureau anemometers above the ground. Maxima of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				Miles	
Amarillo, Tex.....	20	58	w.	Fort Canby, Wash.....	15	7	s. sw.
Chicago, Ill.....	5	73	w.	Idaho Falls, Idaho.....	17	7	sw.
Des Moines, Iowa.....	22	50	nw.	Miles City, Mont.....	23	51	w. nw.
El Paso, Tex.....	15	50	ne.	New York, N. Y.....	23	51	nw.
Do.....	20	52	ne.	Shreveport, La.....	17	2	s.
Do.....	22	60	sw.	Sioux City, Iowa.....	27	7	w. se.
Do.....	26	56	sw.	Woods Hole, Mass.....	14	2	se.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 22 regular stations of the Weather Bureau by its photographic, and at 40 by its thermal effects; at one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table X for each hour of local mean time. In order to complete the record of the duration of cloudiness these registers are supplemented by special personal observations of the state of the sky near the sun in the hours after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence there results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table X for the 61 stations at which instrumental self-registers are maintained.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the durations relative to possible sunshine are derived; the observers' personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been

brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for July, 1897, is 11 per cent for photographic and 13 per cent for thermometric records.

The details are shown in the accompanying table, in which the stations are arranged according to the *total possible duration* of sunshine, and not according to the *observed duration*.

Difference between instrumental and personal observations of sunshine.

Stations.	Latitude.	Apparatus.	For whole month.		Instrumental record of sunshine.			
			Total possible.	Personal.	Photographic.	Difference.	Thermometric.	Difference.
Key West, Fla.....	24 34	T.	419.1	40	5	5	37	37
Tampa, Fla.....	27 57	P. T.	424.9	52	58	+ 6	55	+ 3
Galveston, Tex.....	29 18	P. T.	427.4	79	88	+ 9	79	+ 1
New Orleans, La.....	30 56	P. T.	429.6	45	70	+ 25	46	+ 1
Savannah, Ga.....	32 05	P. T.	434.5	48	75	+ 27	55	+ 22
Vicksburg, Miss.....	33 23	P. T.	434.5	62	75	+ 13	55	+ 22
San Diego, Cal.....	33 43	P. T.	437.2	81	75	+ 6	65	+ 14
Charleston, S. C.....	33 47	P. T.	437.2	51	87	+ 36	65	+ 14
Phoenix, Ariz.....	33 28	P. T.	437.2	79	87	+ 8	79	+ 8
Atlanta, Ga.....	33 45	P. T.	439.7	37	75	+ 38	47	+ 28
Los Angeles, Cal.....	34 03	P. T.	439.7	65	75	+ 10	65	+ 10
Wilmington, N. C.....	34 14	T.	439.7	42	52	+ 10	52	+ 10
Little Rock, Ark.....	34 45	T.	442.0	56	62	+ 6	62	+ 6
Chattanooga, Tenn.....	35 04	T.	442.0	46	53	+ 7	53	+ 7
Santa Fe, N. Mex.....	35 41	P.	444.3	58	65	+ 7	65	+ 7
Raleigh, N. C.....	35 45	T.	444.3	38	79	+ 41	38	+ 41
Nashville, Tenn.....	36 10	T.	444.3	55	69	+ 14	69	+ 14
Fresno, Cal.....	36 43	T.	447.4	91	94	+ 3	94	+ 3
Dodge City, Kans.....	37 45	P.	450.1	73	84	+ 11	73	+ 11
San Francisco, Cal.....	37 48	T.	450.1	70	74	+ 4	74	+ 4
Louisville, Ky.....	38 15	T.	450.1	49	73	+ 24	73	+ 24
St. Louis, Mo.....	38 38	P.	453.0	60	81	+ 21	81	+ 21
Washington, D. C.....	38 54	P.	453.0	50	63	+ 13	63	+ 13
Kansas City, Mo.....	39 05	P.	453.0	67	78	+ 11	78	+ 11
Cincinnati, Ohio.....	39 06	T.	453.0	61	75	+ 14	75	+ 14
Parkersburg, W. Va.....	39 16	T.	453.0	44	58	+ 14	58	+ 14
Baltimore, Md.....	39 18	T.	453.0	44	58	+ 14	58	+ 14
Atlantic City, N. J.....	39 22	P.	453.0	46	58	+ 12	58	+ 12
Denver, Colo.....	39 45	P.	455.2	50	70	+ 20	70	+ 20
Indianapolis, Ind.....	39 46	T.	455.2	58	68	+ 10	68	+ 10
Philadelphia, Pa.....	39 57	T.	455.2	32	55	+ 23	55	+ 23
Columbus, Ohio.....	39 58	T.	455.2	52	68	+ 16	68	+ 16
Harrisburg, Pa.....	40 16	T.	455.2	41	53	+ 12	53	+ 12
Pittsburg, Pa.....	40 32	T.	458.6	48	58	+ 10	58	+ 10
New York, N. Y.....	40 43	T.	458.6	37	50	+ 13	50	+ 13
Salt Lake City, Utah.....	40 46	P.	458.6	62	62	+ 0	62	+ 0
Eureka, Cal.....	40 48	P.	458.6	61	66	+ 5	66	+ 5
Cheyenne, Wyo.....	41 08	P.	458.6	56	66	+ 10	66	+ 10
Omaha, Neb.....	41 16	P.	458.6	66	77	+ 11	77	+ 11
Cleveland, Ohio.....	41 30	T.	461.8	62	69	+ 7	69	+ 7
Des Moines, Iowa.....	41 35	T.	461.8	69	71	+ 2	71	+ 2
Chicago, Ill.....	41 53	T.	461.8	50	59	+ 9	59	+ 9
Erie, Pa.....	42 07	T.	461.8	46	56	+ 10	56	+ 10
Binghamton, N. Y.....	42 08	T.	461.8	37	47	+ 10	47	+ 10
Detroit, Mich.....	42 30	T.	461.8	63	76	+ 13	76	+ 13
Boston, Mass.....	42 31	T.	461.8	35	48	+ 13	48	+ 13
Dubuque, Iowa.....	42 30	T.	461.8	69	73	+ 4	73	+ 4
Albany, N. Y.....	42 39	T.	465.2	41	51	+ 10	51	+ 10
Buffalo, N. Y.....	42 53	T.	465.2	35	45	+ 10	45	+ 10
Rochester, N. Y.....	43 08	T.	465.2	47	57	+ 10	57	+ 10
Idaho Falls, Idaho.....	43 29	T.	465.2	65	66	+ 1	66	+ 1
Portland, Me.....	43 39	T.	468.4	31	45	+ 14	45	+ 14
Northfield, Vt.....	44 10	P.	468.4	31	44	+ 13	44	+ 13
Eastport, Me.....	44 54	P.	471.7	30	47	+ 17	47	+ 17
St. Paul, Minn.....	44 58	P.	471.7	47	62	+ 15	62	+ 15
Minneapolis, Minn.....	44 59	T.	471.7	47	62	+ 15	62	+ 15
Portland, Oreg.....	45 32	P.	475.7	66	66	+ 0	66	+ 0
Helena, Mont.....	45 32	P.	475.7	66	66	+ 0	66	+ 0
Bismarck, N. Dak.....	46 37	P.	479.6	56	58	+ 2	58	+ 2
Seattle, Wash.....	47 35	T.	483.2	59	64	+ 5	64	+ 5
Spokane, Wash.....	47 40	T.	483.2	55	78	+ 23	78	+ 23

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which the number of reports

of thunderstorms for the whole country were most numerous were: 9th, 249; 10th, 294; 11th, 282; 18th, 243; 23d, 254. They were least numerous on the 12th, 81; 29th, 80.

Reports were most numerous in: Illinois, 245; New York, 240; Ohio, 439; Pennsylvania, 299.

Thunderstorm days were most numerous in: Colorado, 28; Florida, 30; New York, 29; Ohio, 31; Tennessee, 27.

In Canada.—Thunderstorms were reported on the following dates: Halifax, 24; Grand Manan, 9, 30; Yarmouth, 24, 30; Chatham, 5, 6; Father Point, 10, 23; Quebec, 2, 7, 11, 15, 16, 21, 22, 23; Montreal, 1, 5, 11, 14, 16, 20, 23; Rockliffe, 5, 14, 19, 21, 23; Toronto, 11, 18, 22, 23, 30; White River, 9, 17, 26, 27, 30; Port Stanley, 11, 13, 14, 18, 25, 26, 30, 31; Saugeen, 18; Parry Sound, 11, 14, 20, 22; Port Arthur, 3, 4, 8, 9; Winnipeg, 2, 4, 5, 8, 18, 28, 29; Minnedosa, 5, 13, 17, 25; Qu'Appelle, 1, 3, 6; Medicine Hat, 10, 25; Swift Current, 5, 6, 8, 10, 21, 24; Calgary, 9; Prince Albert, 4, 30; Edmonton, 1, 17, 24, 30; Battleford, 6, 7, 21.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 9th to the 17th, inclusive. On the remaining twenty-two days of this month 123 reports were received, or an average of about 6 per day. The dates on which the number of reports of auroras for the whole country especially exceeded this average were: 21st, 51; 30th, 39.

Reports were most numerous in: Iowa, 11; Michigan, 22; Ohio, 17; Wisconsin, 19.

The number of reports was a large percentage of the number of observers in: Michigan, 20; Ohio, 13; South Carolina, 14; Wisconsin, 31.

In Canada.—Auroras were reported on the following dates: Halifax, 21; Charlottetown, 21; Father Point, 21, 26, 28, 29; Quebec, 21; Montreal, 21, 30; White River, 22; Saugeen, 20; Winnipeg, 6; Minnedosa, 29, 30; Medicine Hat, 18; Swift Current, 31; Prince Albert, 20, 21, 30.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Snowfall and rainfall are expressed in inches.

Alabama.—The mean temperature was 81.1°, or 0.6° above normal; the highest was 105°, at Decatur on the 3d, and the lowest, 50°, at Maple Grove on the 12th and 13th, and at Newburg on the 14th. The average precipitation was 4.78, or 0.38 below normal; the greatest monthly amount, 10.49, occurred at Newton, and the least, 0.56, at Clanton.—*F. P. Chaffee.*

Arizona.—The mean temperature was 82.4°, or 2.4° above normal; the highest was 118°, at Texas Hill; the lowest was 38°, at Fort Defiance on the 19th. The average precipitation was 1.62, or 0.42 above normal; the greatest monthly amount, 9.65, occurred at Benson, while none fell at Casa Grande.—*W. T. Blythe.*

Arkansas.—The mean temperature was 82.5°, or 2.3° above normal; the highest was 109°, at Keesees Ferry on the 30th and 31st, and the lowest, 50°, at Keesees Ferry on the 14th, and at Silver Springs on the 13th and 14th. The average precipitation was 3.25, or 0.66 below normal; the greatest monthly amount, 8.19, occurred at Moore, and the least, 0.65, at Washington.—*F. H. Clarke.*

California.—The mean temperature is obtained by dividing the State into equal areas, finding the mean of each square, and then dividing by the number of squares. The mean temperature was 74.5°, or 1.4° above normal; the highest was 124°, at Salton on the 22d. At Volcano Springs a temperature of 123° occurred on the 9th, while 120° occurred at Palm Springs, 118° at Ogilby, and 115° at Indio and Mammoth Tank; the lowest was 21°, at Bodie on the 6th and 22d, and at Nevada City on the 7th. The average precipitation was 0.01, or 0.04 below normal; the greatest monthly amount, 0.62, occurred at Descanso; at most places no rain fell.—*W. H. Hammon.*

Colorado.—The mean temperature was 65.5°, or 1.8° below normal; the highest was 109°, at Lamar on the 8th, and the lowest, 21°, at Walden, in North Park, on the 20th. Freezing temperatures occurred at a number of stations of moderate elevation on the 20th. The average precipitation was 2.05, or 0.15 below normal; the greatest monthly amount, 4.65, occurred at Minneapolis, and the least, 0.12, at Vilas. Snow fell at mountain stations on the 3d and 19th, the greatest amount reported being 10 inches at Ruby.—*F. H. Brandenburg.*

Florida.—The mean temperature was 82.1°, or slightly above normal; the highest was 102°, at Macclenny on the 1st and 2d, and the lowest, 60°, at Gainesville on the 15th. The average precipitation was 6.90, or 1.67 above normal; the greatest monthly amount, 14.82, occurred at Meyers, and the least, 2.19, at Pensacola.—*A. J. Mitchell.*

Georgia.—The mean temperature was 80.6°, or 0.2° below normal; the highest was 107°, at Leverett on the 3d, and the lowest, 46°, at Diamond on the 14th. The average precipitation was 5.74, or 0.58 above normal; the greatest monthly amount, 14.43, occurred at Gainesville, and the least, 1.15, at Cordele.—*J. B. Marbury.*

Idaho.—The mean temperature was 64.0°; the highest was 108°, at Minidoka on the 25th, and the lowest, 27°, at Lake on the 17th and at Martin and Swan Valley on the 19th. The average precipitation was

0.75; the greatest monthly amount, 2.43, occurred at Murray, and the least, trace, at Burnside and Martin.—*D. P. McCallum.*

Illinois.—The mean temperature was 77.0°, or 1.2° above normal; the highest was 106°, at Atwood on the 9th, and the lowest, 48°, at Scales Mound and Zion on the 13th. The average precipitation was 3.45, or 0.44 above normal; the greatest monthly amount, 7.85, occurred at Coatsburg, and the least, 0.93, at Jordans Grove.—*C. E. Linney.*

Indiana.—The mean temperature was 76.9°, or 2.1° above normal; the highest was 104°, at Kokomo on the 8th, and the lowest, 44°, at Hammond on the 13th. The average precipitation was 3.36, or 0.23 above normal; the greatest monthly amount, 9.09, occurred at Evansville, and the least, 0.74, at Hammond.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 75.6°, or 1.6° above normal; the highest was 106°, at Malvern on the 23d, and the lowest, 42°, at Rockwell City on the 12th. The average precipitation was 3.26, or about 1.00 below normal; the greatest monthly amount, 7.60, occurred at Stuart, and the least, 1.01, at Osceola.—*G. M. Chappel.*

Kansas.—The mean temperature was 80.2°, or 1.9° above normal; the highest was 111°, at Wallace on the 6th, and the lowest, 45°, at Goodland on the 19th. The average precipitation was 3.13, or 0.60 below normal; the greatest monthly amount, 7.13, occurred at McPherson, and the least, 0.05, at Pratt.—*T. B. Jennings.*

Kentucky.—The mean temperature was 77.8°, or 1.5° above normal; the highest was 107°, at Pilot Oak on the 31st, and the lowest, 50°, at Eubank on the 14th. The average precipitation was 4.79, or 0.41 above normal; the greatest monthly amount, 9.05, occurred at Alpha, and the least, 0.82, at Ensor.—*Frank Burke.*

Louisiana.—The mean temperature was 83.1°, or 1.4° above normal; the highest was 104°, at Liberty Hill on the 6th, 25th, 26th, and 27th, and at Montgomery on the 26th; the lowest was 56°, at Oak Ridge on the 14th. The average precipitation was 3.83, or 1.79 below normal; the greatest monthly amount, 8.09, occurred at Amite, and the least, 0.44, at Robeline.—*R. E. Kerkam.*

Maryland and Delaware.—The mean temperature was 75.6°, or 0.5° above normal; the highest was 102°, at Westernport on the 3d, and the lowest, 41°, at Deer Park on the 14th. The average precipitation was 6.94, or 3.17 above normal; the greatest monthly amount, 19.90, occurred at Jewell, and the least, 2.78, at Cherryfields.—*F. J. Walz.*

Michigan.—The mean temperature was 72.1°, or 2.8° above normal; the highest was 104°, at Clinton on the 9th, and the lowest, 22°, at Humboldt on the 14th. The average precipitation was 3.23, or 1.00 above normal; the greatest monthly amount, 10.10, occurred at Bay City, and the least, 0.16, at Benton Harbor.—*O. F. Schneider.*

Minnesota.—The mean temperature was 71.5°, or 1.1° above normal; the highest was 102°, at Lawrence on the 18th, and the lowest, 38°, at Tower on the 28th. The average precipitation was 6.62, or 2.97 above normal; the greatest monthly amount, 12.81, occurred at Milaca and St. Cloud, and the least, 2.79, at Caledonia.—*T. S. Outram.*

Mississippi.—The mean temperature was 82.8°, or 1.5° above normal; the highest was 109°, at Columbus on the 3d and 4th, and the lowest, 52°, at Aberdeen on the 14th. The average precipitation was 4.42, or 0.58 above normal; the greatest monthly amount, 9.78, occurred at Leakesville, and the least, 0.95, at Hernando.—*R. J. Hyatt.*

Missouri.—The mean temperature was 78.8°, or 1.7° above normal; the highest was 106°, at New Madrid and Princeton on the 31st, and the lowest, 48°, at Ironton and Potosi on the 14th. The average pre-